5.2 CP0201, CP0291, CP0292

5.2.1 General information

The Compact CPUs are ideal for situations where cycle times in the millisecond range are acceptable and value is the deciding factor. A range of models with CAN and Ethernet can adapt optimally to all demands. The result: extremely sleek automation solutions.

- Embedded µP 16/µP 25 with additional I/O processor
- 100 KB / 750 KB User SRAM
- 1 MB / 3 MB User FlashPROM
- CP0291 and CP0292: Ethernet on-board
- Only 37.5 mm wide
- Battery-free

5.2.2 Order data

CP0201

CP0291, CP0292

Model number	Short description
X20CP0201	X20 CPU, Compact CPU µP 16, 100 KB SRAM, 1 MB Flash FPROM, RS232 and CAN, corresponds to Compact CPU base
X20CP0291	X20 CPU, Compact CPU µP 16, 100 KB SRAM, 1 MB Flash FPROM, RS232 and CAN support, corresponds to Compact CPU base, 1 Ethernet interface 100 Base-T
X20CP0292	X20 CPU, Compact CPU µP 25, 750 KB SRAM, 3 MB Flash FPROM, RS232 and CAN support, corresponds to Compact CPU base, 1 Ethernet interface 100 Base-T

Table 55: X20 Compact CPUs - Order data

Model number	Required accessories
X20TB12	X20 terminal block, 12-pin, 24 V coded
X20BB22	X20 Compact CPU base, for Compact CPU and Compact CPU supply module, base for integrated RS232 interface, X20 connection, X20 end plates (left and right), X20AC0SL1/X20AC0SR1 included
X20BB27	X20 Compact CPU base, for Compact CPU and Compact CPU supply module, base for integrated RS232 and CAN interfaces, X20 connection, X20 end plates (left and right), X20AC0SL1/X20AC0SR1 included
X20PS9500	X20 supply module for Compact and fieldbus CPUs and internal I/O supply, X2X Link bus supply
X20PS9502	X20 supply module for Compact and fieldbus CPUs and internal I/O supply, X2X Link bus supply, supply feed not electrically isolated
	Included in delivery
X20AC0SL1	X20 locking plate (left)
X20AC0SR1	X20 locking plate (right)

Table 55: X20 Compact CPUs - Order data

5.2.3 Technical data

Product ID	CP0201	CP0291	CP0292
Short description			
System module	CPU		
Processor	Embedded µP 16		Embedded µP 25
Interfaces	-	1x Ethernet onboard	
Controller			
Fastest task class cycle time	4 ms		2 ms
Typical instruction cycle time	0.8 µs		0.5 µs
Standard memory User RAM User PROM	100 KB SRAM [1] 1 MB FlashPROM		750 KB SRAM [1] 3 MB FlashPROM
Permanent variables Memory Buffer duration	2.75 KB FRAM [2] 45 years		
Backup battery	No		
Integrated I/O processor	Processes I/O data points in the background		
Real-time clock [3]	Yes, resolution 1 s		
Interfaces			
Interface IF2 Type Design Transfer rate Cable length	-	Ethernet Shielded RJ45 port 100 MBit/s Max. 100 m between two stations (segment length)	
Additional interfaces X20BB22 X20BB27	Compact CPU base module with integrated RS232 interface Compact CPU base module with integrated RS232 and CAN interfaces		

Table 56: X20 Compact CPUs - Technical data

Product ID	CP0201	CP0291	CP0292
General information			
Status indicators	CPU function	CPU function, Ethernet	
Diagnostics CPU function Ethernet Over-temperature	Yes, with status LED - -	Yes, with status LED Yes, with status LED -	Yes, with status LED Yes, with status LED Yes, with software status
Visual Components capability	Limited (User PROM)		Yes
ACOPOS capability	Limited (User PROM)		Yes
Temperature sensor	No		Yes
Electrical isolation PLC - IF2	-	Yes	
Power consumption	2.2 W	2.7 W	3.0 W
Certification	CE, C-UL-US, GOST-R		
Operating conditions			
Operating temperature Horizontal installation Vertical installation	0°C to +55°C 0°C to +50°C		
Relative humidity	5 to 95%, non-condensing		
Mounting orientation	Horizontal or vertical		
Installation at altitudes above sea level 0 - 2000 m >2000 m	No derating Reduction of ambient temperature by 0.5°C per 100 m		
Protection type	IP20		
Storage and transport conditions			
Temperature	-25°C to +70°C		
Relative humidity	5 to 95%, non-condensing		
Mechanical characteristics			
Spacing [4]	37.5 $^{+0.2}$ mm		
Comment	Order terminal block 1x X20TB12 separately Order supply module 1x X20PS9500 or X20PS9502 separately Order Compact CPU base 1x X20BB22 or X20BB27 separately		

Table 56: X20 Compact CPUs - Technical data (cont.)

1) Not buffered.
2) This FRAM stores its contents ferroelectric alloy. Therefore, no buffer battery is needed.
3) The real-time clock is buffered for approx. 1000 hours by a gold foil capacitor. The gold foil capacitor is completely loaded after 18 continuous hours of operation.
4) Spacing is based on the width of the Compact CPU base X20BB22 or X20BB27. An X20PS9500 or X20PS9502 supply module is also always required for the CPU.

5.2.4 Status LEDs

CP0201

CP0291, CP0292

LED	Color	Status	Description
R/E	Green	On	Application running
	Red	On	SERVICE mode
RDY	Yellow	On	SERVICE or BOOT mode
L/A	Green	On	A link to the Ethernet remote station has been established.
		Blinking	A link to the Ethernet remote station has been established. The LED blinks when Ethernet activity is present on the bus.

Table 57: X20 Compact CPUs - CPU status indicator

5.2.5 Operating and connection elements

CP0201

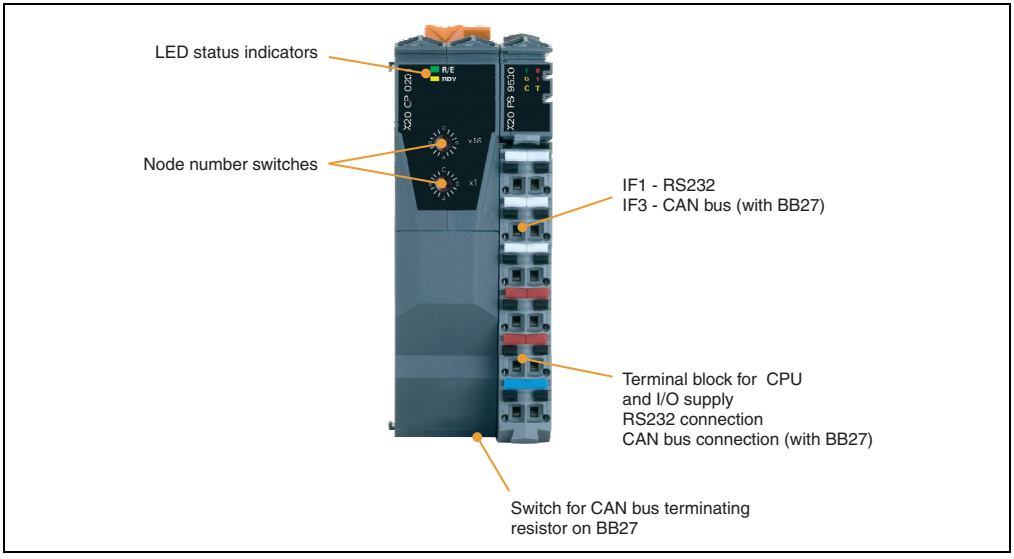

Figure 82: X20 Compact CPUs - Operating elements for CP0201

CP0291 and CP0292

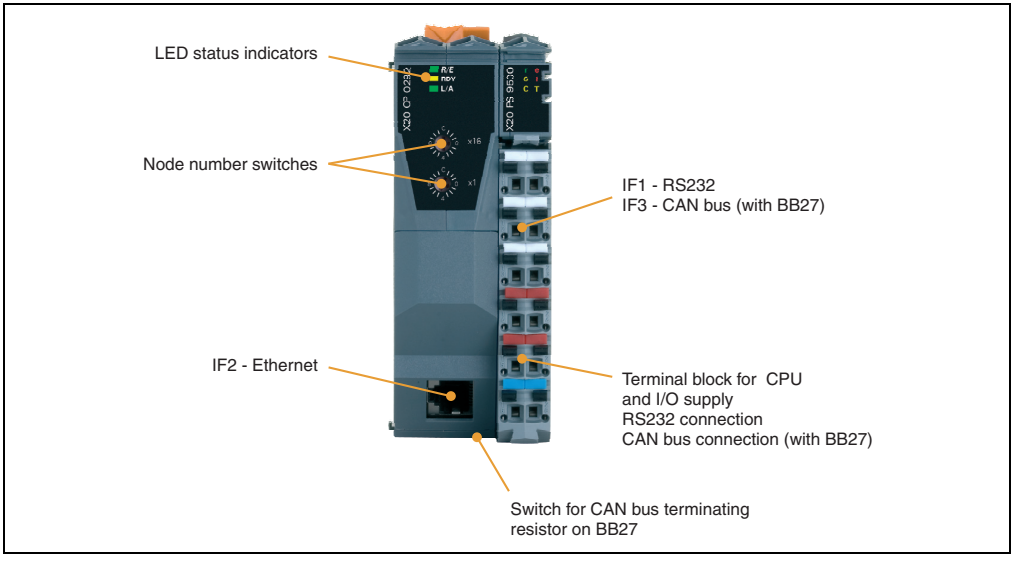

Figure 83: X20 Compact CPUs - Operating elements for CP0291 and CP0292

5.2.6 Node number switches

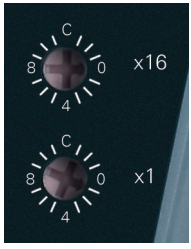

Figure 84: X20 Compact CPUs - Node number switches

The node number is set with the two hex switches. The switch setting can be evaluated by the application program at any time. The operating system only interprets the switch position when switched on.

Switch position	Operating mode	Description
$00	Boot	In this switch position, the operating system can be installed via the RS232 interface configured as online interface. User Flash is only deleted after the update begins.
$01 - $FE	Run	RUN mode, the application is running.
$FF	Diagnostics	The CPU boots in diagnostics mode. Program sections in User RAM and User FlashPROM are not initialized. After diagnostics mode, the CPU always boots with a **cold restart**.

Table 58: X20 Compact CPUs - Operating modes

CP0201

Together with the bus module BB27, the CP0201 has a CAN bus interface. The INA2000 station number for CAN is set using the node number switches.

CP0291 and CP0292

These two CPUs are equipped with an onboard Ethernet interface. When the BB27 bus module is used, they also have a CAN bus interface.

The number set with the two hex switches defines the INA2000 station number of both the CAN an the Ethernet interfaces.

5.2.7 Ethernet interface (IF2)

Figure 85: X20 Compact CPUs - Ethernet interface for CP0291 and CP0292

The CP0291 and CP0292 are equipped with an Ethernet interface. The connection is made using a 100 BASE-T Twisted Pair RJ45 socket.

Please note the following section: 9.1.2 "Wiring guidelines for X20 bus controller with Ethernet cable" on page 265

Information:

The Ethernet interface (IF2) is not suitable for POWERLINK.

Pin assignments

Pin	Assignment	
1	RxD	Receive data
2	RxD\	Receive data\
3	TxD	Transmit data
4	Termination	
5	Termination	
6	TxD\	Transmit data\
7	Termination	
8	Termination	

Table 59: X20 Compact CPUs - Pin assignments - Ethernet interface (IF2)

5.2.8 Programming the system flash

General information

CPUs are delivered with a runtime system. The node number switch is set to switch position $00 when delivered i.e. bootstrap loader mode is set.

A switch position must be set in order to boot the PLC in RUN mode ($01 to $FE). A runtime system update is only possible in RUN mode.

Runtime system update

The runtime system can be updated using the programming system. When updating the runtime system (online runtime system update), the following procedure must be carried out:

1) An online runtime system update is only possible if the processor is in RUN mode. To do this, the set node number must be in the range from $01 to $FE.

2) Switch on the power.

3) The runtime system update is performed via the existing online connection. The online connection can e. g. be established via the serial RS232 OnBoard interface. The update for the Compact CPUs CP0291 and CP0292 can also be performed via the Ethernet interface.

4) Start B&R Automation Studio.

5) Start the update procedure by calling the **Services** command from the **Project** menu. Select **Transfer Operating System...** from the menu shown. Now follow the instructions from B&R Automation Studio.

6) A dialog box is displayed for configuring the runtime system version. The runtime system version is already pre-selected by the user's project settings. Using the drop-down menu, the runtime system versions stored in the project can be selected. Clicking on the **Browse** button allows the selected runtime system version to be loaded from the hard drive or from the CD.

   Pressing **Next >** opens a pop-up window, which allows the user to select whether the modules should also be downloaded with SYSTEM ROM as the target memory during the following runtime system update. Otherwise, modules can also be downloaded later with an application download.

   After pressing **Next >**, a dialog box appears where the user can set the CAN transfer rate, CAN ID and the CAN node number (the CAN node number set here is only relevant if an interface module does not have a CAN node number switch). The CAN node number must be between decimal 01 and 99. Assigning a unique node number is especially important with online communication over a CAN network (INA2000 protocol).

7) The update procedure is started by pressing **Next >**. The update progress is shown in a message box.

Information:

User flash is cleared.

8) When the update procedure is complete, the online connection is automatically reestablished.

9) The PLC is now ready for use.

A runtime system update is not only possible through an online connection, but also through a CAN network, serial network (INA2000 protocol) or an ETHERNET network, depending on the system configuration.